

# Pascal's Wager: From Science to Policy on Early Childhood Development

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## ABSTRACT

Evidence suggests that our brains are shaped profoundly by experiences in early life, with long-lasting implications for development. This science has yet to make the leap to policy on early childhood development in Canada – a shortcoming that has left this country well behind other developed nations. The Pascal Report, released in June 2009, marks an historic opportunity to enact comprehensive early childhood education and care policy in Ontario. Properly implemented, it could serve as a model for such policy across the country. Its successful adoption will require sustained advocacy and ongoing research by the Canadian medical community.

**Key words:** Health policy; knowledge translation; pediatrics; public health

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*Can J Public Health* 2010;101(3):235-36.

The concept that social standing is a key determinant of health has gained widespread currency in scientific and policy circles alike. The impact of the social environment on childhood health and developmental outcomes, however, has only recently garnered concerted attention. Mounting evidence attests to the influence of early experience on brain development, to the consequent links between social standing and developmental trajectories, and to the salutary effect of programs that enhance early childhood education and care (ECEC) on subsequent health and development. Despite a history of leadership in the science of early childhood development (ECD), Canada now lags in translating this knowledge. The Pascal Report, released in June 2009, represents a potential watershed for policy on childhood health and development.<sup>1</sup>

### Experience-based brain development

In light of discoveries in epigenetics – the study of heritable changes in gene function that occur without alterations to DNA sequence – the conceptual tug-of-war between nature and nurture seems reductive and outmoded. Evidence has begun mapping intricate circuits between biology and society, unearthing critical and enduring causal pathways from social circumstance to genetic expression. Nowhere is this more evident than in brain development.

Whereas neuronal structure and function were once understood as largely static and predetermined, recent studies on various aspects of cognition and emotion suggest a remarkable degree of neural plasticity in early life. Neurodevelopment appears to be adaptive, modulated in crucial ways by early experience, with sequelae for phenotype and heredity. Data demonstrate that experience spurs new axonal projections, directs synaptic pruning and induces synapse consolidation. Knudsen's concept of 'sensitive periods' – when experience exerts a crucial influence on neurodevelopment – encapsulates this interaction.<sup>2</sup>

Studies by Szyf and Caspi and colleagues<sup>3,4</sup> support this concept, the former on the effects of nurturing among rat pups, the latter in

the realm of mental health. For example, young neglected by their mothers in early life have impaired negative feedback to their hypothalamic-pituitary-adrenal (HPA) axis, mediated by higher levels of DNA methylation in the hippocampus. This results in exaggerated stress reactivity throughout adulthood, with concomitant increases in morbidity from a variety of causes.<sup>3</sup> Caspi et al. demonstrated that resiliency in the face of childhood abuse is contingent on the interplay between allelic variants of a serotonin transporter gene and levels of abuse among children.<sup>4</sup> In other words, it is insufficient for subjects to have a genotype predictive of adult depression; they have to confront an environmental engine for its expression. In the presence of a nurturing environment, even subjects who lack alleles that confer inherent resilience evince mental health outcomes akin to those in individuals who possess such alleles.<sup>4</sup>

### Early childhood development: Tools and programs

The implications of early neural plasticity for human development are far-reaching. The tendency for income, literacy and health status to climb the social ladder is well documented. This has provoked a paradigm shift in both scientific and social conceptions of self, prompting scientists, educators and policy-makers to reconsider the ideal content of, and contexts for, 'sensitive period' experience.

Wide-ranging studies have sought to hone measures of ECD, identify vulnerable children and youth, and test interventions to enhance their developmental outcomes. Seminal work by Hart and Risley<sup>5</sup> yielded vast differences in language development between

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**Conflict of Interest:** None to declare.

social strata in American society: by age four, children of professional parents had heard cumulatively 30 million more words than those in families on welfare. The vocabulary at age three proved predictive of language skill at age ten.<sup>5</sup> Interventions to mitigate risks in vulnerable children have routinely observed development gains. Programs in settings as diverse as Jamaica, Cuba, Romania and the US have catalogued sustained linguistic, cognitive and behavioural benefits to ECEC interventions.<sup>6</sup>

Canada has led in the measurement and comparison of ECD. The Offord Centre at McMaster University produced one of the most widely used tools, the Early Development Instrument (EDI), with which the Human Early Learning Partnership has mapped development among children in all school districts in British Columbia. The data reveal vastly discrepant developmental outcomes between children of different social strata by age four.<sup>7</sup>

Canadian policy – both provincial and federal – has not kept pace with our knowledge. This contrasts sharply with the pace of change in many other countries. Our relative childhood poverty rate – a fairly linear correlate of childhood mortality – is among the highest of Organisation for Economic Cooperation and Development (OECD) countries. We rank lowest in public expenditure on ECEC services – 0.25% of gross domestic product (GDP), compared with 1.2-1.5% in many other countries – and are behind on most measures of ECD policy performance. Only 18% of Canadian children aged 0-3 are enrolled in childcare; Cuba has achieved near universal enrolment in ECEC services, with national literacy scores well above countries with similar or higher GDP. Of ten key international benchmarks for ECD programming, Canada has achieved but one – a last-place finish among OECD countries.<sup>8</sup>

These are not empty statistics. By Grade 3, only 47% of Toronto children in the lowest income quintile can read. A full quarter – in some neighbourhoods, 70% – of our children are not kindergarten ready when they start school.<sup>9</sup> One in four Ontario children arrive in Grade 1 with vulnerabilities – physical, emotional, social and cognitive – that will challenge them throughout their lives.

### The Pascal Report: A sensitive period

The Pascal Report marks an unprecedented opportunity to reverse these trends, outlining a comprehensive, publicly-funded system of ECEC services for Ontario's children: full-day learning for 4- and 5-year-olds; before- and after-school and summer programs for school-age children; quality programs for children aged 0-4; and enhanced parental leave by 2020.<sup>1</sup> These principles are made flexible, each with funding and program options geared to meet the needs of families of diverse backgrounds and circumstances.

The Report also emphasizes the calibre of pedagogy, in an effort to meet international recommendations on ECE training and provide teachers with the support of team-based models of program delivery. The Report proposes the consolidation of existing child and family programs into a network of Best Start Child and Family Centres, managed by municipalities, partnered with schools. These centres are envisioned as a hub for pre- and postnatal supports, parenting resources and programs, and services for children with special needs.<sup>1</sup> It is a rigorous attempt to put the science of ECD into action, and will require significant individual and system commitments to implement.

We have reached a decisive moment in our development as a polity and a society – a 'sensitive period' writ large. The need for policy change on ECD is manifest, the means to measure its effects well tested. This confluence of evidence, policy precedent, and political momentum will not last forever. The scientific and medical communities have an instrumental role in advocating for improved ECD services in Canada, as our colleagues have done elsewhere. A landmark UNICEF report on child development states: "protecting children from the sharpest edges of poverty during their years of growth and formation is...the mark of a civilized society".<sup>10</sup> Let us make our mark.

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Received: September 7, 2009

Accepted: January 23, 2010

### RÉSUMÉ

L'ensemble des recherches suggère que nos cerveaux sont profondément influencés par nos expériences de première enfance, avec des effets durables sur le développement humain. Par contre, cette connaissance n'a pas encore fait le lien avec les politiques concernant le domaine du développement de la petite enfance au Canada – un manque qui nous laisse bien derrière autres pays développés. Le rapport Pascal, publié en juin 2009, marque une occasion historique pour mettre en vigueur des politiques compréhensives dans le domaine de l'éducation et de soins de la petite enfance en Ontario. Exécutée judicieusement, une telle initiative pourrait servir comme modèle pour le développement de ces politiques à travers le pays, le succès desquelles exigera une plaidoirie soutenue et de recherches en outre par la communauté médicale canadienne.

**Mots clés :** politiques de santé; traduction de connaissances; pédiatrie; santé publique